day 36

3.4/61b) "The Quotient Rule must be used to evaluate $\frac{d}{dx}\left(\frac{x^2+3x+2}{x}\right)$"

$$\frac{x^2+3x+2}{x} = \frac{x^2}{x} + \frac{3x}{x} + \frac{2}{x}$$

$$= x + 3 + 2x^{-1}$$

day 36

3.5/11) "Why is it not possible to evaluate $\lim_{x \to 0} \frac{\sin x}{x}$ by direct substitution"

$\Rightarrow$ because $\frac{\sin x}{x}$ is not defined when $x=0$

Oct 21-7:31 AM

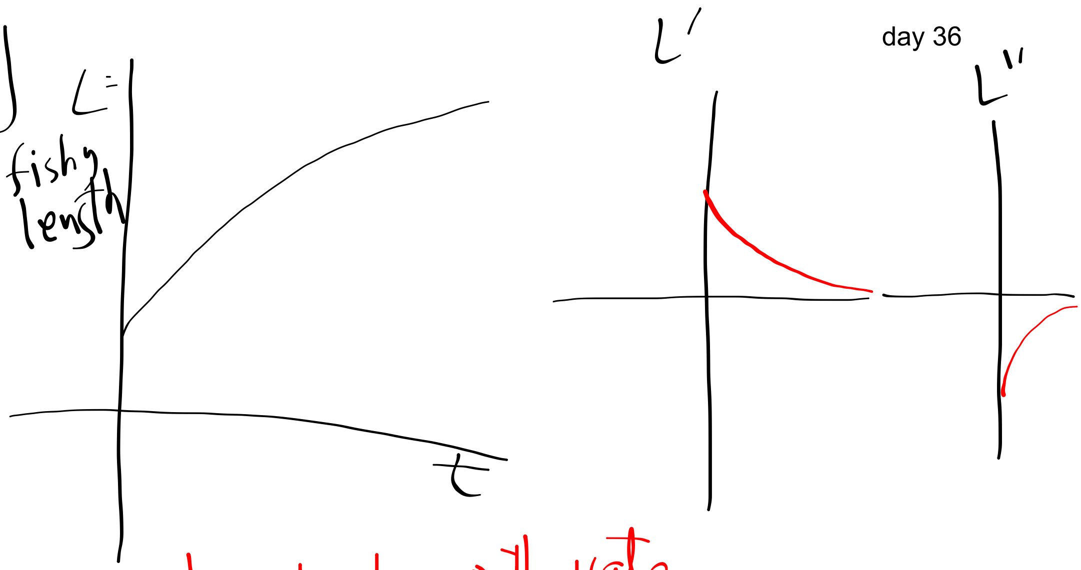
day 36

Generic Rant about lazy students

21) problem = answer [product rule]

22) $\frac{d}{dx}(fg) = f'g'$ [Not the product rule]

3.6|26)



a) $\frac{dL}{dt}$ represents inst. growth rate. as t increases, growth rate slows down

b) growth pattern + (if small enough) how big the fish gets

3.7/23

day 36

$$y = 5(7x^3+1)^{-3}$$

$$y' = \frac{dy}{dx}\left(5(7x^3+1)^{-3}\right) = 5\frac{dy}{dx}\left((7x^3+1)^{-3}\right)$$

$$x \xmapsto{7x^3+1} 7x^3+1 \xmapsto{x^{-3}} (7x^3+1)^{-3}$$

$$= 5(-3)(7x^3+1)^{-3-1} \cdot \frac{d}{dx}(7x^3+1) =$$

$$-15(7x^3+1)^{-4}(21x^2) = -315x^2(7x^3+1)^{-4}$$

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day 36

$y = 5(7x^3+1)^{-3}$

Let $y(u) = u^{-3}$ where $u(x) = 7x^3+1$

$5 \quad y' = \frac{dy}{du} \cdot \frac{du}{dx} = -3(u)^{-4} \cdot (21x^2)$

$= -3(7x^3+1)^{-4} \cdot (21x^2)$

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3.7/40)

day 36

a) Approximate rate of change of temp with resp. to time at 1.5 hrs into flight.

refers to: INSTANTaneous

⇒ Approximate instantaneous r.o.c. with AVERAGE rate of c.

Guideline: pick smallest interval possible

ans: $(\text{Temp})'(1.5) \approx \frac{2.5-2.1}{2-1.5} = .8\ \text{km/hr} \cdot 6.5 = 5.2^\circ / \text{hr of ascent}$

OR

$'' \approx \frac{2.1-1.7}{1.5-1} = \frac{.4}{.5} = .8 \frac{\text{km}}{\text{hr}} \cdot 6.5 = 5.2^\circ / \text{hr of ascent}$

b) an increase in lapse rate would make the decrease in temperature larger

c)

3.8/6 $x = e^y$ slope at $(2, \ln 2)$

day 36

in implicit differentiation

$$\frac{d}{dx}\left(f(x)\right) = f'(x)$$

$$\frac{d}{dx}\left(g(y)\right) = g'(y) \cdot \frac{dy}{dx}$$

$$1 = e^y \cdot \frac{dy}{dx} \Rightarrow \frac{1}{e^y} = \frac{dy}{dx}$$

b) $\frac{dy}{dx} = \frac{1}{e^y}$ every time I see x replace with TWO; $\frac{1}{x} = \frac{dy}{dx}$ (subst for orig)

every time I see y replace with $\ln$ TWO

$$\left.\frac{dy}{dx}\right|_{(2,\ln 2)} = \frac{1}{e^{\ln 2}} = \frac{1}{2}$$

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3.7/25) $y = \sec(3x+1)$

$\frac{d}{dx}(\sec x) = \sec x \tan x$

day 36

$$\frac{dy}{dx} = \left[\sec(3x+1)\tan(3x+1)\right] \cdot \frac{d}{dx}(3x+1)$$

$$\frac{dy}{dx} = \sec(3x+1)\tan(3x+1) \cdot 3$$

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day 36

3.7/14 $y = e^{\sqrt{x}}$ think exp(sqrt(x))

$x \longmapsto \sqrt{x} \longmapsto e^{\sqrt{x}}$

$y' = \left(e^{\sqrt{x}}\right) \cdot \frac{d}{dx}\left(\sqrt{x}\right) = e^{\sqrt{x}} \cdot \frac{d}{dx} x^{1/2}$

$y' = e^{\sqrt{x}} \cdot \left(\frac{1}{2} x^{-1/2}\right) = \frac{e^{\sqrt{x}}}{2\sqrt{x}}$

$y = e^{\sqrt{x}}$

$y(u) = e^{u}$ where $u(x) = \sqrt{x}$

$u(x) = x^{\frac{1}{2}}$

$y'(u) = e^{u}$ $u'(x) = \frac{1}{2\sqrt{x}}$

$\boxed{x^{\frac{1}{m}} = \sqrt[m]{x}}$

So $y' = e^{\sqrt{x}} \cdot \frac{1}{2\sqrt{x}}$

$\sqrt{x} \cdot \sqrt{x} = x$

$x^{a} \cdot x^{a} = x^{1}$

$x^{2a} = x^{1}$ so $2a = 1$